

WHAT IS CLAIMED IS:

- 1 1. In a network environment comprising a data processing system
2 coupled to a storage area network (SAN), a method of dynamically loading code modules, the
3 method comprising:
4 executing a program on the data processing system, and upon execution:
5 accessing device information, the device information comprising
6 information identifying a set of SAN device identifiers and a set of code modules associated
7 with the set of SAN device identifiers;
8 loading the set of code modules referenced by the device information
9 into an address space of the executing program;
10 while executing the program:
11 providing a signal to the executing program indicating that the device
12 information has been modified to produce modified device information ;
13 in response to the signal:
14 deleting the set of code modules referenced by the device
15 information before modification from the address space of the executing program;
16 accessing the modified device information; and
17 loading a set of code modules referenced by the modified
18 device information into the address space of the executing program.
- 1 2. The method of claim 1 wherein:
2 the device information includes at least a first SAN device identifier
3 associated with a first code module, and in the modified device information the first SAN
4 device identifier is associated with a second code module instead of the first code module;
5 and
6 loading the set of code modules referenced by the modified device information
7 into the address space of the executing program comprises loading the second code module
8 into the address space of the executing program.
- 1 3. The method of claim 2 further comprising:
2 before receiving the signal:
3 scanning the SAN to discover a set of SAN devices, the set of SAN
4 devices including a first SAN device whose device identifier matches the first SAN device
5 identifier; and

6 using the first code module associated with the first SAN device
7 identifier to monitor the first SAN device; and
8 after loading the set of code modules referenced by the modified device
9 information into the address space of the executing program:
10 using the second code module instead of the first code module to
11 monitor the first SAN device.

1 4. The method of claim 1 wherein:
2 the device information includes at least a first SAN device identifier
3 associated with a first code module, and the modified device information includes
4 information identifying a second SAN device identifier and a code module associated with
5 the second SAN device identifier, the second device identifier not included in the device
6 information before modification; and
7 loading the set of code modules referenced by the modified device information
8 into the address space of the executing program comprises loading the code module
9 associated with the second SAN device identifier into the address space of the executing
10 program.

1 5. The method of claim 4 further comprising:
2 scanning the SAN to discover a first SAN device, the SAN device identifier
3 associated with the first SAN device matching the second SAN device identifier; and
4 using the code module associated with the second SAN device identifier to
5 monitor the first SAN device.

1 6. The method of claim 1 further comprising:
2 before receiving the signal:
3 scanning the SAN to discover a first set of SAN devices; and
4 for each SAN device in the first set of SAN devices:
5 if the identifier associated with the SAN device matches a SAN
6 device identifier in the set of SAN device identifiers included in the device information, using
7 the code module associated with the matching SAN device identifier to monitor the SAN
8 device.

1 7. The method of claim 1 wherein the device information is stored in a
2 plurality of files, each file including information related to a SAN device identifier from the

3 set of SAN device identifiers and information related to a code module associated with the
4 SAN device identifier.

1 8. In a network environment comprising a data processing system
2 coupled to a storage area network (SAN), a method of loading code modules, the method
3 comprising:

4 executing a program on the data processing system;
5 accessing device information, the device information including information
6 related to a set of SAN device identifiers and information identifying a set of code modules
7 associated with the set of SAN device identifiers, the device information including
8 information related to a first SAN device identifier and a first code module associated with
9 the first SAN device identifier;

10 loading the set of code modules identified in the device information into an
11 address space of the executing program;

12 using the set of code modules to monitor devices coupled to the SAN whose
13 device identifiers match identifiers in the set of SAN device identifiers;

14 while executing the program:

15 providing a signal to the executing program indicating that the device
16 information has been modified, the modified device information not including information
17 related to the first SAN device identifier; and

18 in response to the signal:

19 deleting the first code module associated with the first SAN
20 device identifier from the address space of the executing program.

1 9. The method of claim 8 wherein:

2 the device information before modification is stored in a set of files, each file
3 including information related to a SAN device identifier from the set of SAN device
4 identifiers and information related to a code module associated with the SAN device
5 identifier, the set of files including a first file including information related to the first SAN
6 device identifier and information identifying the first code associated with the first SAN
7 device identifier; and

8 the modified device information is stored in a set of files not including the first
9 file.

1 10. In a network environment comprising a data processing system
2 coupled to a storage area network (SAN), a method of loading code modules, the method
3 comprising:
4 executing a program on the data processing system;
5 accessing information related to a first SAN device identifier, the information
6 related to the first SAN identifier including information identifying a first code module
7 associated with the first SAN device identifier;
8 loading the first code module into an address space of the executing program;
9 while executing the program:
10 receiving a signal indicating that the information related to the first
11 SAN device identifier has been modified, the modified information identifying a second code
12 module associated with the first SAN device identifier instead of the first code module;
13 in response to the signal:
14 deleting the first code module associated with the first SAN
15 device identifier from the address space of the executing program; and
16 loading the second code module into the address space of the
17 executing program.

1 11. The method of claim 10 further comprising:
2 before receiving the signal:
3 scanning the SAN to identify at least a first device coupled to the SAN;
4 determining an identifier associated with the first device; and
5 if the identifier associated with the first device matches the first SAN
6 device identifier, using the first code module loaded into the address space of the program to
7 monitor the first device; and
8 after loading the second code module:
9 if the identifier associated with the first device matches the first SAN
10 device identifier, using the second code module loaded into the address space of the program
11 to monitor the first device.

1 12. The method of claim 11 wherein using the second code module loaded
2 into the address space of the program to monitor the first device comprises:
3 instantiating an object using the second code module;
4 associating the object with the first device; and

5 using the object to monitor the first device.

1 13. The method of claim 11 wherein determining the identifier associated
2 with the first device comprises using SNMP protocol to determine the identifier.

1 14. In a network environment comprising a data processing system
2 coupled to a storage area network (SAN), a method of loading code modules, the method
3 comprising:
4 executing a program on the data processing system;
5 accessing devices information comprising a set of SAN device identifiers
6 including a first SAN device identifier, the devices information further comprising
7 information identifying code modules associated with SAN device identifiers in the set of
8 SAN device identifiers including information identifying a first code module associated with
9 the first SAN device identifier;

10 loading the set of code modules associated with the set of SAN device
11 identifiers including the first code module into an address space of the executing program;

12 while executing the program:

13 receiving a signal indicating that the devices information has been
14 modified, the modified devices information including a second SAN device identifier and a
15 second code module associated with the second SAN device identifier, the second SAN
16 device identifier not included in the set of SAN device identifiers included in the devices
17 information before modification;

18 in response to the signal:

19 loading the second code module into the address space of the
20 executing program.

1 15. The method of claim 14 further comprising:

2 scanning the SAN to identify a set of devices coupled to the SAN;

3 for each device in the set of devices:

4 determining an identifier associated with the device;

5 if the identifier associated with the device matches the first SAN
6 device identifier, using the first code module loaded into the address space of the program to
7 monitor the device; and

8 if the identifier associated with the device matches the second SAN
9 device identifier, using the second code module loaded into the address space of the program
10 to monitor the device.

1 16. The method of claim 15 wherein using the second code module loaded
2 into the address space of the program to monitor the device comprises:
3 instantiating an object using the second code module;
4 associating the object with the device whose identifier matches the second
5 SAN device identifier; and
6 using the object to monitor the device.

1 17. The method of claim 15 wherein determining the identifier associated
2 with the device comprises using SNMP protocol to determine the identifier.

1 18. The method of claim 14 wherein the devices information is stored in a
2 plurality of files, each file including information related to a SAN device identifier from the
3 set of SAN device identifiers and information related to a code module from the set of code
4 modules associated with the SAN device identifier.

1 19. In a network environment comprising a data processing system
2 coupled to a storage area network (SAN), a method of loading code modules, the method
3 comprising:
4 executing a program on the data processing system;
5 accessing information related to a SAN device identifier, the information
6 related to the SAN identifier including information identifying a code module associated with
7 the SAN device identifier;
8 loading the code module into an address space of the executing program;
9 while executing the program:
10 receiving a signal indicating that the code module has been modified;
11 in response to the signal:
12 deleting the previously loaded code module from the address
13 space of the executing program; and
14 loading the modified code module into the address space of the
15 executing program.

1 20. A computer program product stored on a computer-readable medium
2 for dynamically loading code modules, the computer program product comprising:
3 code for accessing device information, the device information comprising
4 information identifying a set of SAN device identifiers and a set of code modules associated
5 with the set of SAN device identifiers; and
6 code for loading the set of code modules referenced by the device information
7 into an address space of an executing application program;
8 code for using the set of code modules referenced by the device information
9 and loaded into the address space of the executing application program to manage a storage
10 are network (SAN);
11 code for receiving a signal while the application program is executing, the
12 signal indicating that the device information has been modified to produce modified device
13 information ;
14 code for deleting the set of code modules referenced by the device information
15 before modification from the address space of the executing application program in response
16 to the signal:
17 code for accessing the modified device information;
18 code for loading a set of code modules referenced by the modified device
19 information into the address space of the executing application program; and
20 code for using the set of code modules referenced by the modified device
21 information and loaded into the address space of the executing application program to
22 manage the SAN.

1 21. The computer program product of claim 20 wherein:
2 the device information includes at least a first SAN device identifier
3 associated with a first code module, and in the modified device information the first SAN
4 device identifier is associated with a second code module instead of the first code module;
5 and
6 the code for loading the set of code modules referenced by the modified
7 device information into the address space of the executing application program comprises
8 code for loading the second code module into the address space of the executing application
9 program.

1 22. The computer program product of claim 20 wherein:

2 the code for using the set of code modules referenced by the device
3 information and loaded into the address space of the executing application program to
4 manage the SAN comprises:
5 code for scanning the SAN to discover a set of SAN devices, the set of
6 SAN devices including a first SAN device whose device identifier matches the first SAN
7 device identifier; and
8 code for using the first code module associated with the first SAN
9 device identifier to manager the first SAN device; and
10 the code for using the set of code modules referenced by the modified device
11 information and loaded into the address space of the executing application program to
12 manage the SAN comprises:
13 code for using the second code module instead of the first code module
14 to manage the first SAN device.

1 23. The computer program product of claim 20 wherein:
2 the device information includes at least a first SAN device identifier
3 associated with a first code module, and the modified device information includes
4 information identifying a second SAN device identifier and a code module associated with
5 the second SAN device identifier, the second device identifier not included in the device
6 information before modification;
7 the code for using the set of code modules referenced by the device
8 information and loaded into the address space of the executing application program to
9 manage the SAN comprises:
10 code for scanning the SAN to discover a first set of SAN devices; and
11 for each SAN device in the first set of SAN devices, if the identifier
12 associated with the SAN device matches a SAN device identifier in the set of SAN device
13 identifiers included in the device information, code for using the code module associated with
14 the matching SAN device identifier to monitor the SAN device;
15 the code for loading the set of code modules referenced by the modified
16 device information into the address space of the executing application program comprises
17 code for loading the code module associated with the second SAN device identifier into the
18 address space of the executing application program; and

19 the code for using the set of code modules referenced by the modified device
20 information and loaded into the address space of the application program to manage the SAN
21 comprises:
22 code for scanning the SAN to discover a first SAN device, the SAN
23 device identifier associated with the first SAN device matching the second SAN device
24 identifier; and
25 code for using the code module associated with the second SAN device
26 identifier to monitor the first SAN device.

1 24. A computer program product stored on a computer readable medium
2 for dynamically loading code modules, the computer program product comprising:
3 code for accessing device information, the device information including
4 information related to a set of SAN device identifiers and information identifying a set of
5 code modules associated with the set of SAN device identifiers, the device information
6 including information related to a first SAN device identifier and a first code module
7 associated with the first SAN device identifier;
8 code for loading the set of code modules identified in the device information
9 into an address space of an executing application program;
10 code for using the set of code modules to manage devices coupled to the SAN
11 whose device identifiers match identifiers in the set of SAN device identifiers;
12 code for receiving a signal from the executing application program, the signal
13 indicating that the device information has been modified, the modified device information not
14 including information related to the first SAN device identifier; and
15 code for deleting the first code module associated with the first SAN device
16 identifier from the address space of the executing program. in response to the signal.

1 25. The computer program product of claim 24 wherein:
2 the device information before modification is stored in a set of files, each file
3 including information related to a SAN device identifier from the set of SAN device
4 identifiers and information related to a code module associated with the SAN device
5 identifier, the set of files including a first file including information related to the first SAN
6 device identifier and information identifying the first code associated with the first SAN
7 device identifier; and

8 the modified device information is stored in a set of files not including the first
9 file.

1 26. A computer program product stored on a computer readable medium
2 for loading code modules, the computer program product comprising:
3 code for accessing information related to a first SAN device identifier, the
4 information related to the first SAN identifier including information identifying a first code
5 module associated with the first SAN device identifier;
6 code for loading the first code module into an address space of an executing
7 application program;
8 code for using the first code module to manage devices coupled to the SAN;
9 code for receiving a signal indicating that the information related to the first
10 SAN device identifier has been modified, the modified information identifying a second code
11 module associated with the first SAN device identifier instead of the first code module;
12 code for deleting the first code module associated with the first SAN device
13 identifier from the address space of the executing application program in response to the
14 signal;
15 code for loading the second code module into the address space of the
16 executing application program; and
17 code for using the second code module to manage devices coupled to the
18 SAN.

1 27. The computer program product of claim 26 further comprising:
2 the code for using the first code module to manage the devices coupled to the
3 SAN comprises:
4 code for scanning the SAN to identify at least a first device coupled to
5 the SAN;
6 code for determining an identifier associated with the first device; and
7 if the identifier associated with the first device matches the first SAN
8 device identifier, code for using the first code module loaded into the address space of the
9 executing application program to monitor the first device; and
10 the code for using the second code module to manage the devices coupled to
11 the SAN comprises:

12 if the identifier associated with the first device matches the first SAN
13 device identifier:
14 code for instantiating an object using the second code module;
15 code for associating the object with the first device; and
16 code for using the object to manage the first device.

1 28. The computer program product of claim 27 wherein the code for
2 determining the identifier associated with the first device comprises code for using SNMP
3 protocol to determine the identifier.

1 29. A computer program product stored on a computer readable medium
2 for loading code modules, the computer program product comprising:
3 code for accessing devices information comprising a set of SAN device
4 identifiers including a first SAN device identifier, the devices information further comprising
5 information identifying code modules associated with each SAN device identifier in the set of
6 SAN device identifiers including information identifying a first code module associated with
7 the first SAN device identifier;
8 code for loading the code modules associated with the set of SAN device
9 identifiers into an address space of an executing application program;
10 code for using the set of loaded code modules to manage a SAN;
11 code for receiving a signal indicating that the devices information has been
12 modified, the modified devices information including a second SAN device identifier and a
13 second code module associated with the second SAN device identifier, the second SAN
14 device identifier not included in the set of SAN device identifiers included in the devices
15 information before modification;
16 code for loading the second code module into the address space of the
17 executing application program in response to the signal; and
18 code for using the loaded code modules corresponding to the set of SAN
19 device identifiers and the second code module to manage the SAN.

1 30. The computer program product of claim 29 wherein the code for using
2 the loaded code modules corresponding to the set of SAN device identifiers and the second
3 code module to manage the SAN comprises:
4 code for scanning the SAN to identify a set of devices coupled to the SAN;
5 for each device in the set of devices:

6 code for determining an identifier associated with the device;
7 if the identifier associated with the device matches the first SAN
8 device identifier, code for using the first code module loaded into the address space of the
9 executing application program to monitor the device; and
10 if the identifier associated with the device matches the second SAN
11 device identifier, code for using the second code module loaded into the address space of the
12 executing application program to monitor the device.

1 31. The computer program product of claim 30 wherein the code for using
2 the second code module loaded into the address space of the executing application program to
3 monitor the device comprises:
4 instantiating an object using the second code module;
5 associating the object with the device whose identifier matches the second
6 SAN device identifier; and
7 using the object to manage the device.

1 32. The computer program product of claim 30 wherein the code for
2 determining the identifier associated with the device comprises code for using SNMP
3 protocol to determine the identifier.

1 33. A computer program product stored on a computer readable medium
2 for dynamically loading code modules, the computer program product comprising:
3 code for accessing information related to a SAN device identifier, the
4 information related to the SAN identifier including information identifying a code module
5 associated with the SAN device identifier;
6 code for loading the code module into an address space of an executing
7 application program;
8 code for using the loaded code modules to manage devices in a SAN;
9 code for receiving a signal indicating that the code module has been modified;
10 code for deleting the previously loaded code module from the address space of
11 the executing application program in response to the signal; and
12 code for loading the modified code module into the address space of the
13 executing application program.

1 34. A network system comprising:

2 a SAN network comprising at least one SAN device; and
3 a computer system coupled to the SAN network, the computer system
4 comprising:
5 a processor;
6 a memory coupled to the processor, the memory configured to store a
7 program for controlling the processor; and
8 the processor operative with the program to
9 access device information, the device information comprising
10 information identifying a set of SAN device identifiers and a set of code modules associated
11 with the set of SAN device identifiers;
12 load the set of code modules referenced by the device
13 information into an address space of the program executed by the processor;
14 receive, while the program is executed by the processor, a
15 signal indicating that the device information has been modified to produce modified device
16 information ;
17 in response to the signal:
18 delete the set of code modules referenced by the device
19 information before modification from the address space of the program executed by the
20 processor;
21 access the modified device information; and
22 load a set of code modules referenced by the modified
23 device information into the address space of the program executed by the processor.

1 35. A network system comprising:
2 a SAN network comprising a plurality of devices; and
3 a computer system coupled to the SAN network, the computer system
4 comprising:
5 a processor;
6 a memory coupled to the processor, the memory configured to store a
7 program for controlling the processor; and
8 the processor operative with the program to
9 access device information, the device information including
10 information related to a set of SAN device identifiers and information identifying a set of
11 code modules associated with the set of SAN device identifiers, the device information

12 including information related to a first SAN device identifier and a first code module
13 associated with the first SAN device identifier;
14 load the set of code modules identified in the device information into
15 an address space of the program executed by the processor;
16 use the set of code modules to manage devices from the plurality of
17 devices coupled to the SAN whose device identifiers match identifiers in the set of SAN
18 device identifiers;
19 receive, while the program is executed by the processor, a signal
20 indicating that the device information has been modified, the modified device information not
21 including information related to the first SAN device identifier;
22 in response to the signal, delete the first code module associated with
23 the first SAN device identifier from the address space of the program executed by the
24 processor.

1 36. The system of claim 35 wherein:
2 the device information before modification is stored in a set of files, each file
3 including information related to a SAN device identifier from the set of SAN device
4 identifiers and information related to a code module associated with the SAN device
5 identifier, the set of files including a first file including information related to the first SAN
6 device identifier and information identifying the first code associated with the first SAN
7 device identifier; and
8 the modified device information is stored in a set of files not including the first
9 file.

1 37. A network system comprising:
2 a SAN network comprising a plurality of devices; and
3 a computer system coupled to the SAN network, the computer system
4 comprising:
5 a processor;
6 a memory coupled to the processor, the memory configured to store a
7 program for controlling the processor; and
8 the processor operative with the program to

9 access information related to a first SAN device identifier, the
10 information related to the first SAN identifier including information identifying a first code
11 module associated with the first SAN device identifier;
12 load the first code module into an address space of the program
13 executed by the processor;
14 receive, while the program is executed by the processor, a
15 signal indicating that the information related to the first SAN device identifier has been
16 modified, the modified information identifying a second code module associated with the
17 first SAN device identifier instead of the first code module; and
18 in response to the signal:
19 delete the first code module associated with the first
20 SAN device identifier from the address space of the executing program; and
21 load the second code module into the address space of
22 the program executed by the processor.

1 38. The system of claim 37 wherein:
2 before receiving the signal, the processor is operative with the program to:
3 scan the SAN to identify at least a first device coupled to the SAN;
4 determine an identifier associated with the first device; and
5 if the identifier associated with the first device matches the first SAN
6 device identifier, use the first code module loaded into the address space of the program to
7 monitor the first device; and
8 after loading the second code module, the processor is operative with the
9 program to use the second code module loaded into the address space of the program to
10 monitor the first device if the identifier associated with the first device matches the first SAN
11 device identifier.

1 39. The system of claim 38 wherein to use the second code module loaded
2 into the address space of the program executed by the processor to monitor the first device,
3 the processor is further operative with the program to:
4 instantiate an object using the second code module;
5 associate the object with the first device; and
6 use the object to monitor the first device.

1 40. The system of claim 38 wherein in order to determine the identifier
2 associated with the first device, the processor is further operative with the program to use
3 SNMP protocol to determine the identifier.

1 41. A network system comprising:
2 a SAN network comprising a plurality of devices; and
3 a computer system coupled to the SAN network, the computer system
4 comprising:
5 a processor;
6 a memory coupled to the processor, the memory configured to store a
7 program for controlling the processor; and
8 the processor operative with the program to
9 access devices information comprising a set of SAN device
10 identifiers including a first SAN device identifier, the devices information further comprising
11 information identifying code modules associated with SAN device identifiers in the set of
12 SAN device identifiers including information identifying a first code module associated with
13 the first SAN device identifier;
14 load the set of code modules associated with the set of SAN
15 device identifiers including the first code module into an address space of the program
16 executed by the processor
17 receive, while the program is executed by the processor, a
18 signal indicating that the devices information has been modified, the modified devices
19 information including a second SAN device identifier and a second code module associated
20 with the second SAN device identifier, the second SAN device identifier not included in the
21 set of SAN device identifiers included in the devices information before modification; and
22 in response to the signal, load the second code module into the
23 address space of the program executed by the processor.

1 42. The system of claim 41 wherein the processor is further operative with
2 the program to:
3 scan the SAN to identify a set of devices coupled to the SAN;
4 for each device in the set of devices:
5 determine an identifier associated with the device;

6 if the identifier associated with the device matches the first SAN
7 device identifier, use the first code module loaded into the address space of the program to
8 monitor the device; and

9 if the identifier associated with the device matches the second SAN
10 device identifier, use the second code module loaded into the address space of the program to
11 monitor the device.

1 43. The system of claim 42 wherein in order to use the second code
2 module loaded into the address space of the program to monitor the device, the processor is
3 further operative with the program to:

4 instantiate an object using the second code module;
5 associate the object with the device whose identifier matches the second SAN
6 device identifier; and
7 use the object to monitor the device.

1 44. The system of claim 42 wherein in order to determine the identifier
2 associated with the device, the processor is further operative with the program to use SNMP
3 protocol to determine the identifier.

1 45. The system of claim 41 wherein the devices information is stored in a
2 plurality of files, each file including information related to a SAN device identifier from the
3 set of SAN device identifiers and information related to a code module from the set of code
4 modules associated with the SAN device identifier.

1 46. A network system comprising:
2 a SAN network comprising a plurality of devices; and
3 a computer system coupled to the SAN network, the computer system
4 comprising:
5 a processor;
6 a memory coupled to the processor, the memory configured to store a
7 program for controlling the processor; and
8 the processor operative with the program to
9 access information related to a SAN device identifier, the
10 information related to the SAN identifier including information identifying a code module
11 associated with the SAN device identifier;

12 load the code module into an address space of the program
13 executed by the processor;
14 receive, while the program is executed by the processor, a
15 signal indicating that the code module has been modified;
16 in response to the signal:
17 delete the previously loaded code module from the
18 address space of the executing program; and
19 load the modified code module into the address space of
20 the executing program.

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